

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claim 1 (Currently Amended): A structure comprising a substrate bearing, on at least part of its surface, a photocatalytic antisoiling layer comprising titanium dioxide (TiO_2), wherein said photocatalytic antisoiling layer is coated with a thin nonporous layer comprising silicon and oxygen and having a covering power, wherein said thin nonporous layer mechanically and chemically protects the underlying photocatalytic layer, while maintaining the photocatalytic activity of the titanium dioxide (TiO_2), and wherein immediately below the photocatalytic antisoiling layer is an underlayer having a crystallographic structure for assisting in the crystallization, by heteroepitaxial growth, in the anatase form of the photocatalytic antisoiling layer, wherein the underlayer is made of BaTiO_3 and/or SrTiO_3 .

Claim 2 (Previously Presented): The structure of claim 1, wherein said thin nonporous layer comprising silicon and oxygen is present in the form of a continuous film.

Claim 3 (Previously Presented): The structure of claim 1 wherein said thin layer comprising silicon and oxygen is present in the form of a film that conforms to the surface asperities of the underlying photocatalytic antisoiling layer.

Claim 4 (Previously Presented): The structure of claim 1 wherein the thin nonporous layer comprising silicon and oxygen is a layer of at least one silicon-oxygen compound selected from the group consisting of SiO_2 , SiOC , SiON , SiO_x , wherein $x < 2$, and SiOCH .

Claim 5 (Previously Presented): The structure of claim 1 wherein the thin nonporous layer comprising silicon and oxygen is a layer of at least one silicon-oxygen compound further comprising at least one compound selected from the group consisting of Al_2O_3 and ZrO_2 .

Claim 6 (Previously Presented): The structure as claimed in claim 5, wherein the Al/Si, the Zr/Si, or the Al/Si and Zr/Si atomic ratio does not exceed 1.

Claim 7 (Previously Presented): The structure of claim 5 wherein the structure comprises Al_2O_3 and wherein the Al/Si ratio is from 0.03 to 0.5.

Claim 8 (Previously Presented): The structure of claim 5, wherein the structure comprises ZrO_2 and wherein the Zr/Si ratio is from 0.05 to 0.4.

Claim 9 (Previously Presented): The structure of claim 1 wherein the thin nonporous layer comprising silicon and oxygen has a thickness of at most 15 nm.

Claim 10 (Previously Presented): The structure as claimed in claim 1, wherein the photocatalytic antisoiling layer consists of TiO_2 alone or of TiO_2 doped with at least one dopant selected from the group consisting of N pentavalent cations of Nb, pentavalent cations of Ta pentavalent cations of V, Fe, and Zr.

Claim 11 (Previously Presented): The structure of claim 1, wherein the photocatalytic antisoiling layer has been deposited by

a sol-gel method,
or by a pyrolysis method
or by room-temperature vacuum sputtering,
using a metal or TiO_x target, wherein $x < 2$, and in an oxidizing atmosphere, or using a TiO_2 target in an inert atmosphere, the TiO_2 produced by the sputtering then optionally being subjected to a heat treatment so as to be in the crystallized state in a photocatalytically active form.

Claim 12 (Previously Presented): The structure of claim 1, wherein the thin nonporous layer comprising silicon and oxygen has been deposited by room-temperature vacuum sputtering using a target of Al (8 at%)-doped Si, in an Ar/O_2 atmosphere, at a pressure of 0.2 Pa.

Claim 13 (Canceled).

Claim 14 (Previously Presented): The structure of claim 1, wherein the substrate comprises a sheet,
whether plane or having curved faces, wherein the sheet comprises at least one material selected from the group consisting of monolithic glass, laminated glass, glass-ceramic, and a hard thermoplastic, or glass fibers, or glass-ceramic fibers,
wherein said sheet or said fibers have, optionally, received at least one other functional layer before application of photocatalytic antisoiling layer or or have, optionally, received a layer for assisting in the crystallization of the photocatalytic antisoiling layer by heteroepitaxial growth.

Claim 15 (Previously Presented): The structure of claim 14, comprising the at least one other functional layer, wherein the at least one other functional layer is selected from the group consisting of at least one layer having an optical functionality, at least one thermal control layer and at least one conducting layer, and wherein, if the substrate comprises glass or glass-ceramic, the at least one other functional layer acts as a barrier to the migration of alkali metals from the glass or from the glass-ceramic.

Claim 16 (Withdrawn): A process for manufacturing the structure of claim 1, comprising

depositing an optionally doped TiO_2 layer on a substrate comprising glass, glass-ceramic, polycarbonate-type hard plastic, of the sheet type, glass fibers, or glass-ceramic fibers,

wherein said optionally doped TiO_2 layer is optionally subjected to a heat treatment in order to give it a photocatalytic property if the photocatalytic property is not provided by the conditions used for depositing the optionally doped TiO_2 layer, and

depositing a thin layer comprising silicon and oxygen on said photocatalytic layer, to form the structure of claim 1.

Claim 17 (Withdrawn): The process of claim 16, wherein the deposition of the TiO_2 layer and the thin layer comprising silicon and oxygen are carried out in succession at room temperature, by vacuum sputtering, in the same chamber, the conditions being the following:

- for depositing the TiO_2 layer, supply in AC or DC mode, at a pressure of 1-3 mbar and in an oxygen/inert gas (argon) atmosphere, using a Ti or TiO_x , target, where $x = 1.5$ to 2; and

- for depositing the layer comprising silicon and oxygen, supply in AC mode at a pressure of 0.1 to 1.0 Pa and in an Ar/O₂ atmosphere using a target having a high silicon content,

the deposition of the TiO₂ layer being optionally preceded by the deposition of an underlayer for assisting in the crystallization by epitaxial growth in the anatase form of the TiO₂ layer.

Claim 18 (Withdrawn): The process of claim 16, wherein the substrate is a glass or glass-ceramic substrate, wherein, before application of the TiO₂ layer, at least one layer forming a barrier to the migration of alkali metals present in the glass or glass-ceramic substrate is deposited on the substrate, and wherein, optionally, an annealing or toughening operation is carried out after the TiO₂ layer and the thin layer covering the TiO₂ layer have been deposited.

Claim 19 (Withdrawn): The process of claim 18, wherein, after the application of the at least one layer forming a barrier to the migration of alkali metals and before application of the TiO₂ layer, at least one functional layer selected from the group consisting of at least one layer having an optical functionality, at least one thermal control layer, and at least one conducting layer is deposited, wherein said at least one functional layer is advantageously deposited by vacuum sputtering.

Claim 20 (Previously Presented): A single or multiple glazing, comprising, on at least one face respectively, the structure as defined in claim 1.

Claim 21 (Previously Presented): The structure of claim 11, wherein the TiO_2 is subjected to a heat treatment so as to be in the crystallized state in a photocatalytically active form.

Claim 22 (Previously Presented): The structure of claim 11, wherein the room-temperature vacuum sputtering comprises magnetron sputtering.

Claim 23 (Previously Presented): The structure of claim 11, wherein the room-temperature vacuum sputtering comprises ion-beam sputtering.

Claim 24 (Previously Presented): The structure of claim 11, wherein the room-temperature vacuum sputtering comprises magnetron sputtering and ion-beam sputtering.

Claim 25 (Previously Presented): The structure of claim 14, wherein the sheet or the fibers have received at least one other functional layer before application of the photocatalytic antisoiling layer.

Claim 26 (Previously Presented): The structure of claim 14, comprising a layer for assisting in the crystallization of the photocatalytic antisoiling layer by heteroepitaxial growth.

Claim 27 (Withdrawn): The process of claim 16, wherein the TiO_2 layer is doped.

Claim 28 (Withdrawn): The process of claim 17, comprising depositing an underlayer for assisting in the crystallization by epitaxial growth in the anatase form of the TiO₂ layer.

Claim 29 (Withdrawn): The process of claim 18, comprising carrying out an annealing operation, wherein the annealing operation is carried out at a temperature of between 250°C and 500°C.

Claim 30 (Withdrawn): The process of claim 18, comprising carrying out a toughening operation, wherein the toughening operation is carried out at a temperature of at least 600°C.

Claim 31 (Cancelled)